

## C L A I M S

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1. A Raman amplifier system comprising:
  - an optical wave guide having a crystalline material for guiding an optical signal having a first wavelength, the crystalline material having a Raman wavelength shift,
  - a pump configured to pump light into the optical wave guide, the pump light having a second wavelength being substantially equal to the first wavelength minus the Raman wavelength shift.
2. The Raman amplifier system of claim 1, the crystalline material being a semiconductor material, preferably a semiconductor material from group IV, III-V or II-VI, such as silicon, indium-phosphite, gallium-arsenite or silicon-germanium.
3. The Raman amplifier system of claim 1, the optical wave guide having a rib-like geometry of the crystalline material on an insulator layer.
4. The Raman amplifier system of claim 1, the crystalline material being isotopically purified.
5. The Raman amplifier system of claim 1, the crystalline material being an isotopically purified semiconductor, preferably isotopically purified silicon.
6. The Raman amplifier system of claim 1, the optical waveguide being provided by a membrane of a semiconductor layer.
7. The Raman amplifier system of claim 1, the optical waveguide being provided by a defect waveguide in a photonic crystal.

8. The Raman amplifier system of claim 1, further comprising a plurality of the pumps for separate Raman amplification of a plurality of optical signals having a plurality of wavelengths.
9. A method of generating a Raman gain, the method comprising the steps of:
  - providing an optical wave guide having a crystalline material,
  - propagating an optical signal through the optical wave guide, the optical signal having a first wavelength,
  - introducing of pump light into the optical wave guide, the pump light having a second wavelength being substantially equal to the first wavelength minus the Raman wavelength shift.
10. The method of claim 7, further comprising:
  - propagating at least a second optical signal having a third wavelength through the optical wave guide,
  - introducing pump light into the optical wave guide, the pump light having a fourth wavelength being substantially equal to the third wavelength minus the Raman wavelength shift.